

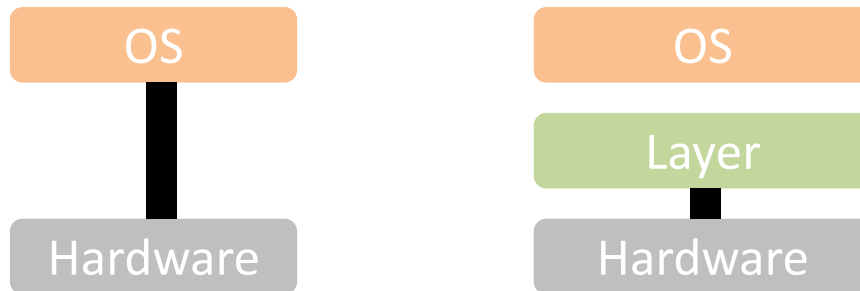
Hypervisors, Virtualization API, Cloud Computing Platforms

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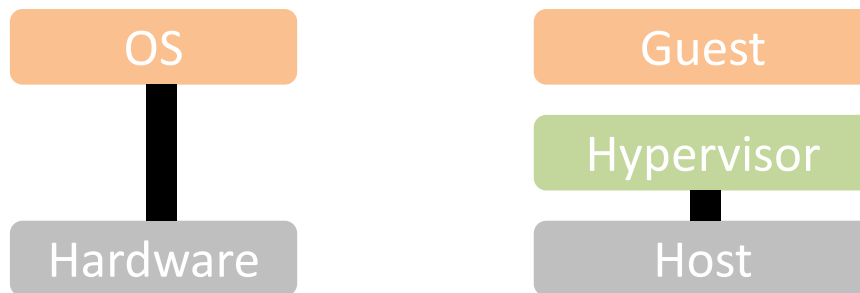
What is virtualization?

Separation of the OS from the hardware.



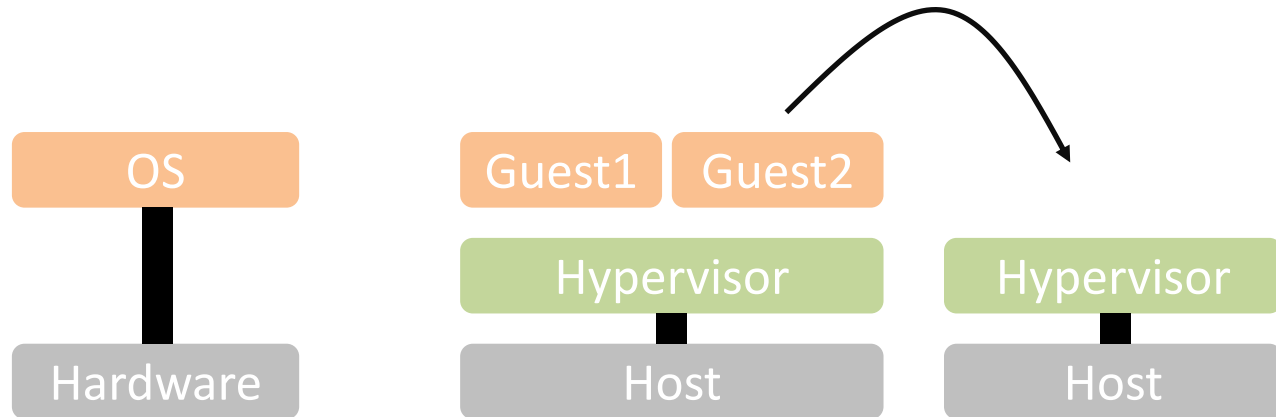
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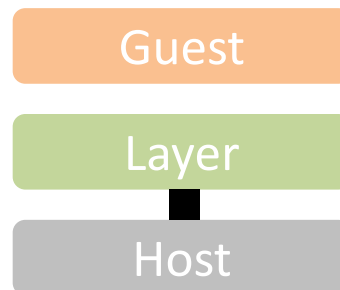
Separation of the OS from the hardware.



Multiple different OS on the same host
Transfer guest between hosts

What is emulation ?

- Provide an instruction set specific to a hardware type
 - The indirection layer converts commands from the guest into commands the host can understand
 - Non-host hardware can be simulated for the VM

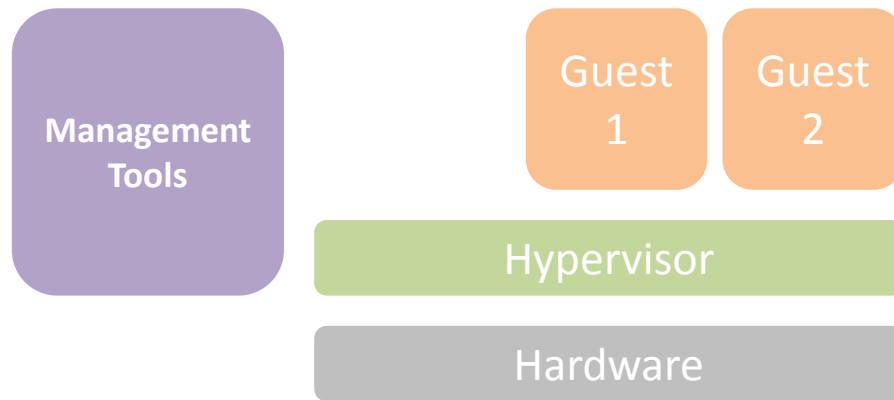


Why use it ?

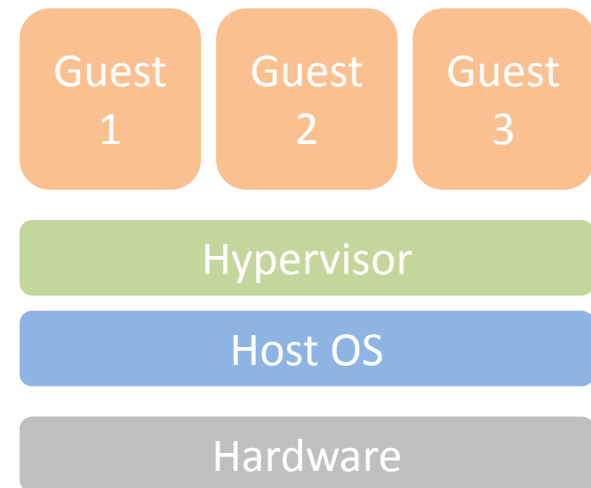
- Better resource usage
 - Average server load without virtualisation: 5%
 - One big instead of several small physical machines (less space, electricity, cooling required)
- More flexibility for server and desktop hosting
 - Different OS on the same host
- Only 5-10% slower

Hypervisors

- Also called Virtual Machine Monitor



Type 1 Hypervisor
(bare metal)

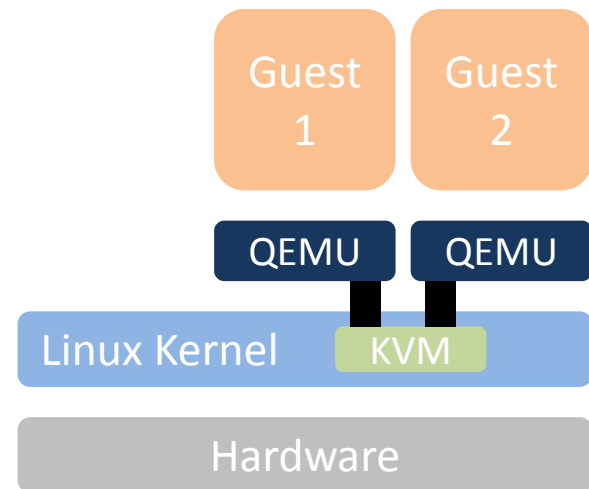


Type 2 Hypervisor
(hosted)

QEMU and KVM

- Kernel based Virtual Machine(KVM)

- Linux kernel module
- Acts like type 1 hypervisor
- Uses Linux functions



- Quick EMUlator(QEMU)

- Provides an environment for the guest OS and passes the instructions from the guest OS to KVM

Terms

- Virtualization
 - Simulate enough hardware so a guest can run unmodified.
 - Most operations are passed on to the hardware.
- Emulation
 - Guest OS is unmodified and does not know that it is being emulated
- Paravirtualization
 - Guest OS uses modified kernel that is aware of virtualization and makes calls to the hypervisor instead of the emulated hardware

What hardware can KVM virtualize?

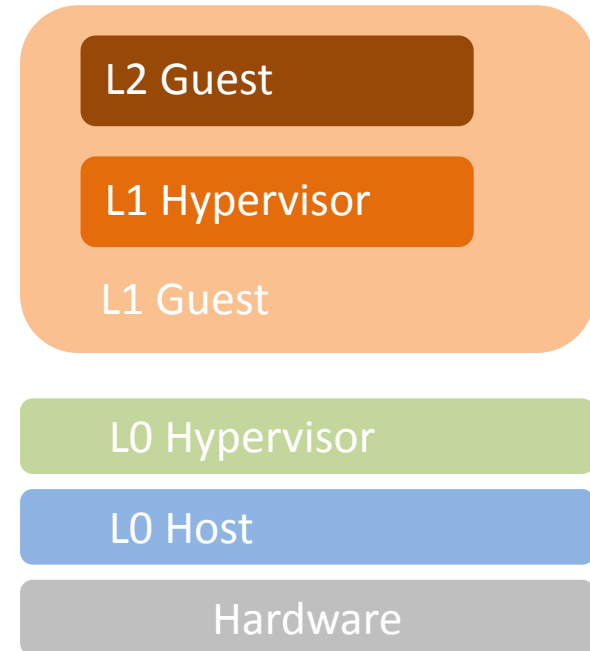
- Processors:
 - X86, PowerPC and IA64
- I/O devices(hard drive, network, graphics etc.)

What hardware can KVM virtualize?

- Processors:
 - X86, PowerPC and IA64
- I/O devices(hard drive, network, graphics etc.)
 - Everything
 - For paravirtualization support, special drivers are necessary
 - Graphics acceleration especially difficult

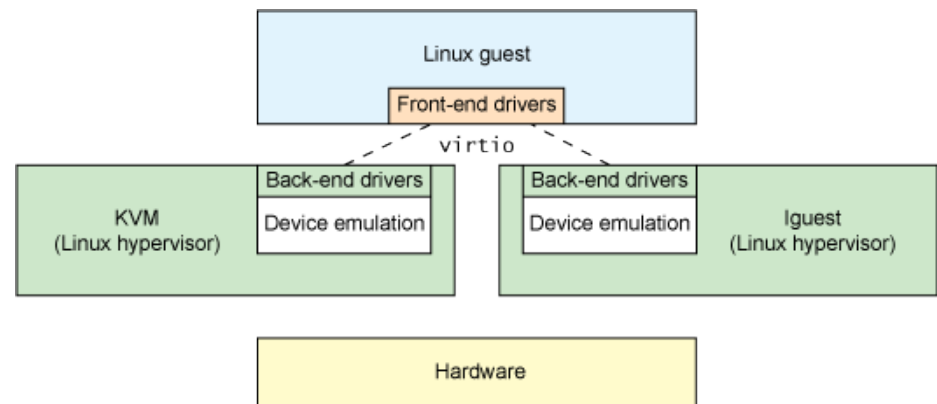
Nested Virtualization

- “Inception” for virtualization
- Reason:
 - Software development



Virtio

- Virtualization standard for KVM that allows paravirtualization
 - Especially hard disk and network drivers



Source: <http://www.ibm.com/developerworks/linux/library/l-virtio/>

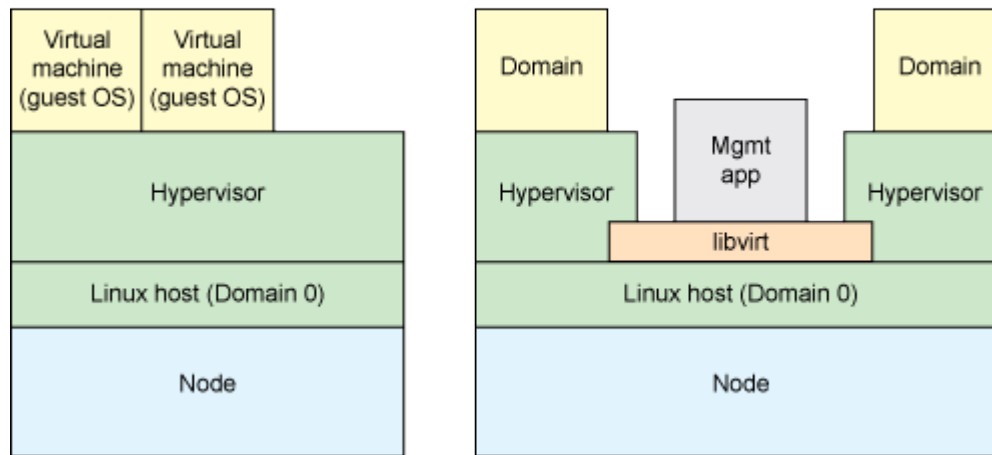
- **-vga vmware**
loads vmware graphics drivers
which are 5x faster than std vga drivers

KVM disk image types

Format	Description	Advantages	Disadvantages
raw	Plain binary	Very portable	Fixed to max. size of image
cloop (compressed loop)	Allows blockwise decompression	High compression (good for live cds)	Slow
cow (copy on write)	Memory is only allocated if required	Dynamic size, convenient snapshotting	Slow when image size needs to grow (e.g. OS installation)
qcow (QEMU cow)	Update of cow		
qcow2	Update of qcow		
vmdk	VMware image format	Image exchange	
vdi	VirtualBox image format	Image exchange	

libvirt

- Virtual machine manager



Source: <http://www.ibm.com/developerworks/linux/library/l-libvirt/>

- Domains are configured in xml files

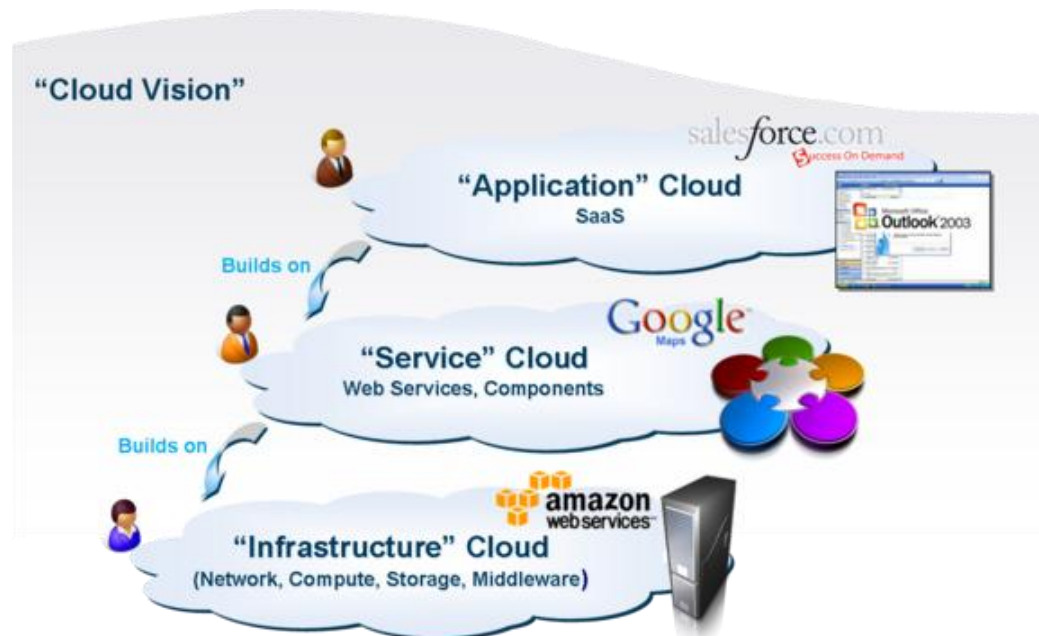
VM migration

- Migration of a VM means moving it from one host to another
- Requirements:
 - The VM must be accessible on the source and destination host (shared storage)
 - Exact same version of hypervisor on both hosts
 - Same network configuration

Cloud Computing

also IaaS(Infrastructure as a service)

- Provides computer infrastructure (software and hardware) via a network to the user
- Virtualization is a part of cloud computing



Cloud Computing Platforms

- OpenNebula

<http://opennebula.org/>

- OpenStack

<http://www.openstack.org>

- Eucalyptus

<http://www.eucalyptus.com/>

Resources

- <http://winfwiki.wi-fom.de/index.php/KVM> Virtualisierung
- <http://www.ibm.com/developerworks/linux/library/l-virtio/>
- http://www.linuxinsight.com/files/kvm_whitepaper.pdf
- <http://www.ibm.com/developerworks/linux/library/l-libvirt/>
- <http://www.linux-kvm.org/page/Migration>
- <http://wiki.libvirt.org/page/Virtio>
- <http://www.ibm.com/developerworks/linux/library/l-hypervisor/>

Thank you 😊

If you have any questions,
feel free to ask.

libvirt

- Domain is configured in an xml file
- Root element is named <domain>
- Cpu configuration is determined in <vcpu>
- Memory is configured in <memory>
- Network is added as a <device>